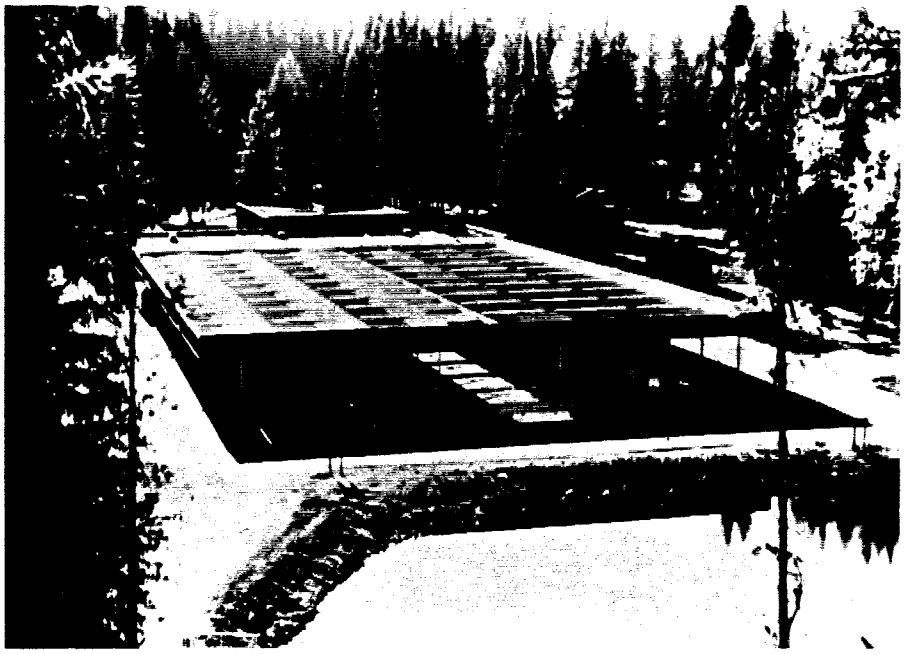
MCCALL SUMMER CHINOOK SALMON HATCHERY

1987 Brood Year Production Report



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by

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ABSTRACT

McCall Summer Chinook Salmon Hatchery was the first hatchery built to enhance the salmon runs into Idaho under the water Resources Development Act of 1976. The hatchery was built in 1979 to rear 1,000,000 smolts for stocking into the South Fork of the Salmon River. A total of 2,705 salmon were trapped in 1987. From these, 3,110,229 eggs were taken from 662 females. Of the 1,200 adult males trapped, 626 were used for spawning, along with 12 of the 384 jacks that were trapped. From the total eggs taken, 611,051 eyed eggs were shipped to the Pahsimeroi Hatchery, 366,800 fry were released into Johnson Creek, 87,800 fry into Sand Creek, 101,900 fry into Cabin Creek, 201,000 fry into the East Fork of the South Fork of the Salmon River, and 975,000 smolts were released into the South Fork of the Salmon River.

The only major disease problem at McCall during the rearing cycle was chronic Bacterial Kidney Disease. "Spring Thing" accounted for 1.7% loss during May 1988. There was approximately 75% survival from green egg to release.

The production of 975,000 smolts and 757,582 fry used 65,045 pounds of feed for a conversion of 1.46 pounds of feed per pound of fish.

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INTRODUCTION

Hydroelectric dams on the Columbia and Snake Rivers have reduced Idaho's salmon runs to critically low levels. In 1976, Congress enacted the Water Resources Development Act, a portion of which is the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). The LSRCP compensates Idaho for losses of fish and wildlife caused by the Lower Snake River projects (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams). The McCall Summer Chinook Hatchery was the first hatchery built as partial fulfillment of the LSRCP.

LOCATION

McCall Hatchery was constructed in 1979 by the U.S. Army Corps of Engineers. Operational funds are provided by the U.S. Fish and Wildlife Service (USFWS), and the facility is staffed and operated by the Idaho Department of Fish and Game (IDFG). The hatchery is located within the city limits of McCall, Idaho, on the North Fork Payette River approximately 0.16 km. (1/4 mile) downstream from Payette Lake.

OBJECTIVES

The objectives of the McCall Summer Chinook Salmon Hatchery are:

1. Restore summer chinook salmon Oncorhynchus tshawytscha to the South Fork of the Salmon River; historically a major summer chinook stream in Idaho.

2. Trap and spawn adult salmon returning to the South Fork of the Salmon River.

3. Raise 1,000,000 summer chinook smolts for release in the South Fork of the Salmon River.

4. Rear 1,000,000 summer chinook to fry stage and plant into historical spawning and rearing areas of the South Fork drainage.

5. Evaluate fish rearing capabilities of the McCall Hatchery.

FISH REARING FACILITIES

Fish rearing facilities include: 26 eight-tray stacks of Heath incubators; two fiberglass Heath troughs, 0.53 m x 4.72 m (1.75 ft x 15.5 ft); 14 concrete vats, 1.22 m x 12.19 m (4 ft x 40 ft); 2 outdoor concrete rearing ponds 12.8 m

x 60.96 m (42 ft x 200 ft); and 1 collection basin 4.57 m x 30.78 m (15 ft x 101 ft). Designed capacity of the hatchery is 1,000,000 smolts averaging 37.4 fish per kilogram (17 fish per pound).

An adult trapping and spawning facility is located on the South Fork of the Salmon River near Cabin Creek, approximately 41.8 km (26 miles) east of Cascade, Idaho. This facility is equipped with a removable weir, fish ladder, trap, two adult holding ponds, 3 m x 26.8 m (10 ft x 88 ft), and covered spawning area. Water is supplied from the South Fork of the Salmon River through an 84 cm (33 inch) under ground pipeline. Holding capacity for the facility is approximately 1,000 adults. Adults trapped in excess of egg requirements are passed above the weir for natural spawning. Eggs collected at the facility are transported to McCall for incubation, hatching, and rearing. Resulting smolts are transported back to the South Fork of the Salmon River for release.

WATER SUPPLY

Hatchery water is obtained from Payette Lake through a 91.4 cm (36 inch) underground pipeline. Water may be taken from the surface or from a depth of 15.25 m (50 ft), thus providing the capability of obtaining the best water temperature available.

Through an agreement with Payette Lake Reservoir Company, 570 liters per second (20 cubic feet per second) can be used for hatchery operations. Design criteria and production goals were established using this constraint, ensuring that the hatchery has enough water to meet its production goals.

Water quality analysis reveals a somewhat "distilled" system for rearing fish. Total hardness ranges from 6.3 to 7.06 mg $CaCO^3/1$, while pH stays at about 6.8. There are no problems with heavy metals, and although at times we have had gas supersaturation, it has not posed any problems.

STAFFING

The hatchery is staffed with three permanent employees; a manager (Hatchery Superintendent II), an assistant manager (Hatchery Superintendent I) and a Fish Culturist. In addition, two 8-month and two 3-month temporary employees are employed to assist during the busy field season.

FISH PRODUCTION

The weir and trap on the South Fork of the Salmon River were put in operation on June 7, 1987. Trapping and spawning operations were concluded on September 8, 1987. During this period, 2,705 salmon were trapped (Table 1.)

Table 1. McCall Hatchery summer chinook salmon adult return data by year.

Run date	Jacks	4-year males	4-year females	5-year males	5-year females	Total
1980	186	*	*	*	*	380
1981	124	171	135	31	63	524
1982	48	294	168	12	28	550
1983	504	108	164	85	76	937
1984	595	296	417	135	86	1,529
1985	828	467	792	47	104	2,238
1986	1,222	723	581	52	112	2,690
1987	386	1,158	959	82	120	2,705

Jacks = <65 cm
four-year-olds = 65 cm through 89 cm
five-year-olds = >89 cm

Fork lengths were taken on all salmon returning to the weir (Figures 1 and 2). Three hundred eighty-six jacks (<65 cm; 26 in) represented 14% of the run this year. These fish are from the 1986 release of 970,483 smolts. The 2,117 four-year-old fish (65 to 89 cm; 26 to 35 in) were returns from the 1985 release of 564,405 smolts, and the 202 five-year-old fish (>89 cm.; 35 in.) that returned were from the 1984 release of 269,880 smolts.

Of the returning fish, 366 were adipose clipped indicating a coded wire tag. There were 238 noses collected and sent to the IDFG laboratory in Lewiston for tag recovery and code identification (Appendix 6).

Spawntaking began on August 7, 1987, and was terminated on September 8, 1987. During the eleven spawntakes, the hatchery crew took 3,110,229 green eggs. During this period, 626 adult males and 12 jacks were used to fertilize these eggs from 662 females.

There were 141 male, 66 jack, and 136 female mortalities, or 12.7% of the total fish trapped. Sixty females were sampled for BKD and other pathogens by hatchery personnel. All eggs taken were water hardened in a 200 ppm solution of active iodine for one hour before being transported to the hatchery (See FISH HEALTH). There were no drugs or chemicals used on the adults, and all of the carcasses were given away to the public on a first come first serve basis.

EARLY REARING

Approximately 2,365 cc (80 fluid ounces) of eggs were placed in the incubator trays supplied with 22.7 1pm (6 gpm) flow. The number of green eggs was estimated using the displacement method. The eggs eyed after accumulating

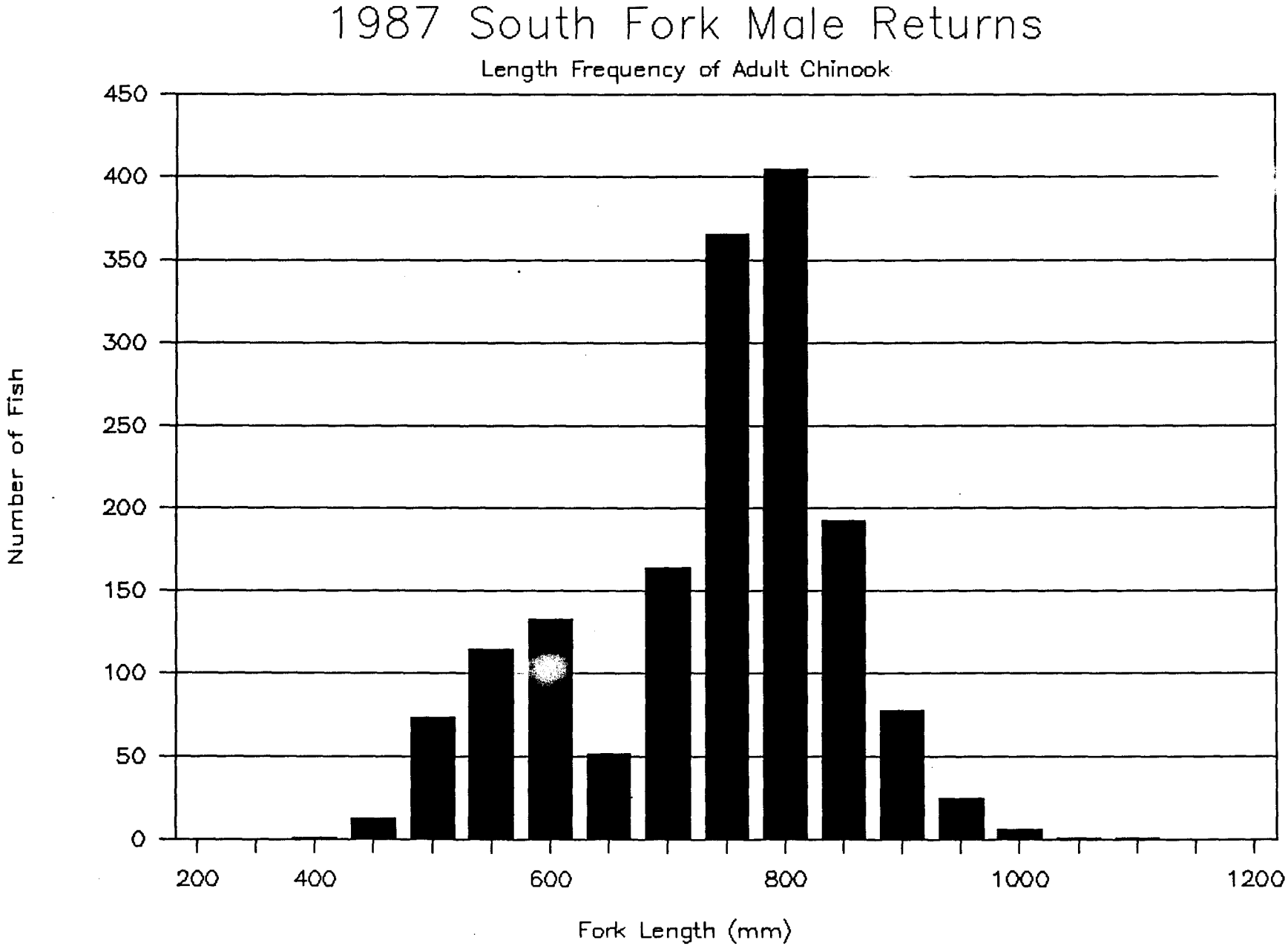


Figure 1. Length-frequency of adult male summer chinook.

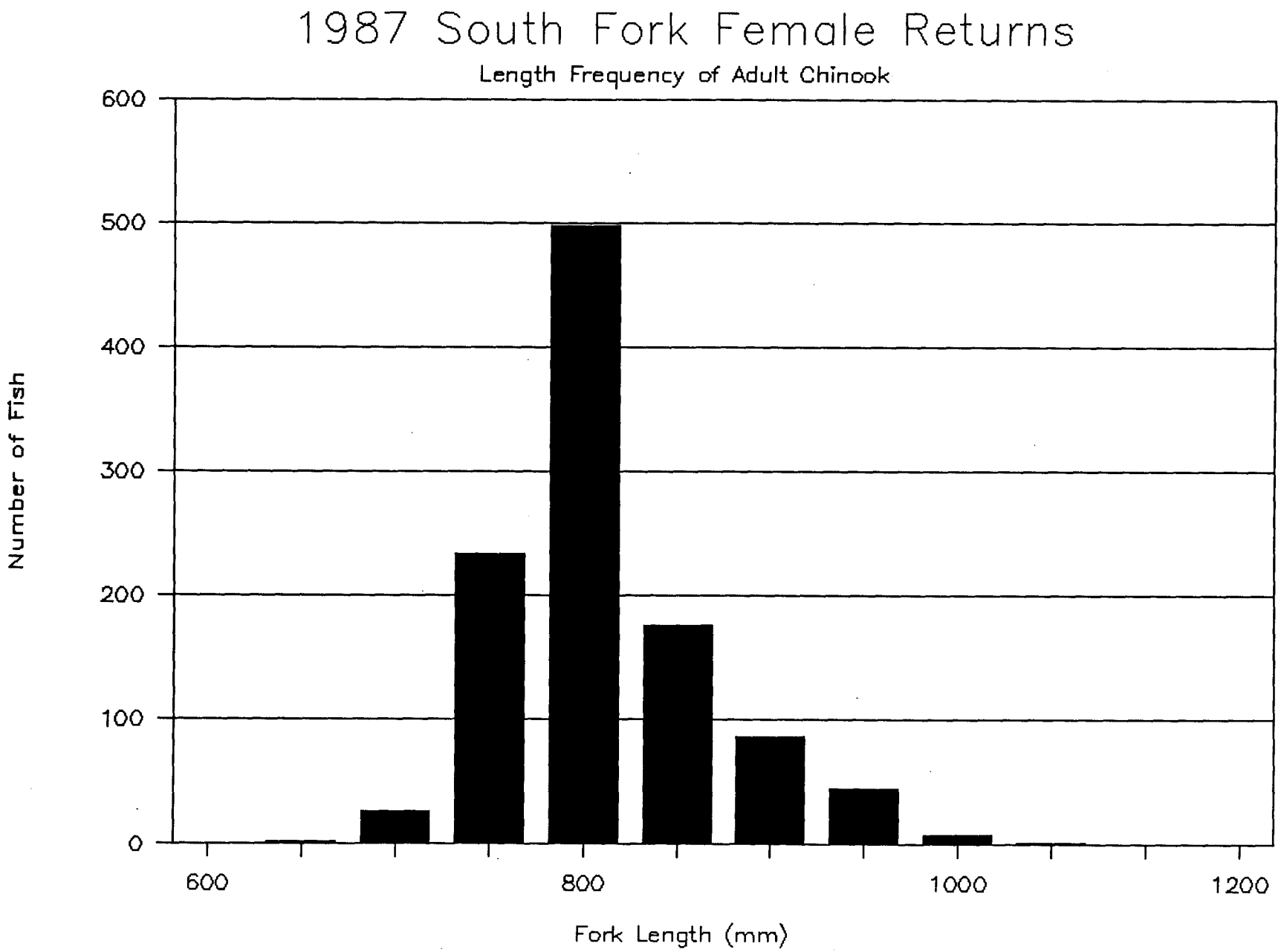


Figure 2. Length-frequency of adult female summer chinook.

approximately 500 Daily Temperature Units (DTU), at which time dead eggs were removed using an electronic picker From the 3,110,229 green eggs collected, 2,526,006 eyed eggs (81.2%) were counted using an electronic counter and returned to the Heath incubator trays. The Pahsimeroi Hatchery received 611,051 of these eyed eggs.

The remaining eggs hatched at approximately 900 DTUs, and swim-up fry were transferred to the vats after accumulating 1,700 DTUs. Of the 1,914,955 remaining eyed eggs, 1,872,496 swim-up fry (98% survival) were set out to the vats (Figure 3). The initital loading rates ranged from 120,000 to 150,000 fish per vat.

The fish were held in the indoor rearing vats until they were approximately 700 fish per kilogram (320 per pound). They were then transferred during May to the outdoor ponds and reared there until release the following spring at 45.93 fish per km (20.8 per pound). The survival rate of the 1,872,496 swim-up fry to ponding was 97.3%, or 1,084,720 fish. There were 757,582 fish out-planted as fry prior to ponding.

Water temperatures of 3 to 4°C (36 to 38°F) during early rearing at McCall result in extremely slow growth rates. The daily length increase ("L) during cold water rearing was only .066 mm (.0026 inches). As temperatures increased, growth rates also increased. During the summer months, the daily length increase ranged between 0.254 to 0.584 mm (0.01 to 0.023 inches) due to warmer water.

The swim-up fry were initially fed OMP-II starter mash (3% body weight) for the first two days on feed. For the next five days they were fed a 1:1 mix of starter mash and OMP-IV 0.8 mm (1/32) pellet, also at 3% body weight per day. For the remainder of the indoor rearing, they were fed the 0.8 mm (1/32) pellet at levels determined by the formula:

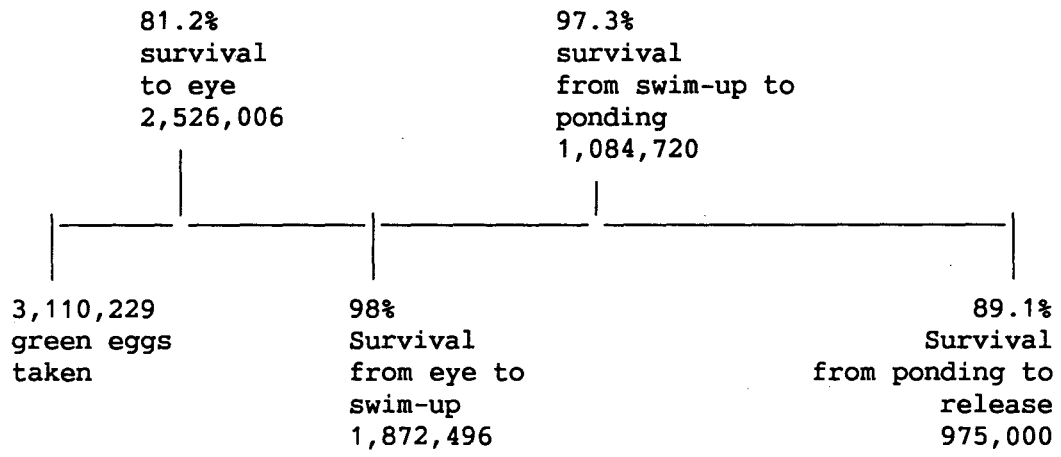
$$\% \text{ BW} = \text{Hatchery Constant}/\text{total length}$$

Where:

$$\text{Hatchery Constant} = \text{Conversion} \times 3 \times \text{"L} \times 100$$

(Table 2.) (Piper et al. 1982). The OMP-IV diet had ten times the normal pantothenic acid added to control the incidence of "Spring Thing." Once the fish were ponded outside, feed size changed as growth increased, with the 3.175 mm (1/8 in) OMP-II pellet being the largest size fed to the pre-smolts. Feeding frequency varied with fish size and water temperature. Swim-up fry were hourly, fingerlings were fed six times per day, and pre-smolts were fed two to four times per day depending upon water temperature.

Figure 3. Survival of the Brood Year 1987 summer chinook at various life stages.



Note: The percent survival from ponding to release takes into account transfers of fry and eyed eggs.

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Table 2. Hatchery constants and feeding rates used at McCall Hatchery on summer chinook salmon during the growth period (above 38°F) for the Brood Year 1987 fish.

Month	Conversion	^{A}L	Total 1.	HC	%BW	Temp F
Mar	1.78	.0056	1.76	2.99	1.69	37
Apr	1.58	.0073	1.98	3.46	1.74	39
May	.91	.0113	2.32	3.08	1.33	45
Jun	1.07	.0206	2.94	6.61	2.24	52
Jul	1.03	.0226	3.62	6.98	1.93	53
Aug	1.86	.0160	4.10	8.92	2.17	51
Sep	2.01	.0090	4.37	5.43	1.24	46
Oct	1.69	.0103	4.68	5.22	1.12	44
Nov	1.77	.0050	4.83	2.66	.55	40
Dec	2.95	.0036	4.94	3.19	.65	38

Fish were sampled and pound-counted on the first of each month. Length-weight relationships were determined, feeding rates adjusted, and the fish were monitored for general health.

Hatchery vats were cleaned daily, and brushes and nets designated for each vat were disinfected in a 600 ppm Benzalkonium Chloride (50%) solution after each use. Mortalities were collected daily, recorded, and frozen for disposal. The outside rearing ponds were cleaned as needed by means of a vacuum system, with eventual discharge into the settling pond. Outside mortality was collected daily, recorded, and frozen for disposal.

FISH DISTRIBUTION

Fish Taqqinq and Markinq

During the period September 12 to September 29, 1988, fish were Coded Wire Tagged (CWT), fin clipped, and freeze-branded. On March '21 to March 22, 1989, 3,034 fish were PIT-tagged. Of the 311,083 fish that were CWT and adipose clipped, 52,224 were also freeze branded (RA-R1,2,3). Only 10,019 fish were freeze-branded only (RA-R4) (Table 3). A summary of tags released is shown in Appendix 4.

Table 3. Brood Year 1987 Coded Wire Tag codes and freeze brands used at McCall Hatchery.

Dates tagged	Pond	No. marks released	Tag code	Remarks
9/12-20/88	1	46,400	10-31-41	All CWT were for
	1	46,250	10-31-42	US/Canada
	1	46,400	10-31-43	contribution.
9/20-29/88	2	44,350	10-31-44	
	2	43,025	10-31-45	
	2	41,325	10-31-46	
	2	14,100	RA-R1	Same fish as 10-
	2	13,775	RA-R2	31-46.
	2	15,850	RA-R3	Same as above.
	2	9,175	RA-R4	
3/21-22/89	1	3,029	PIT	
TOTAL		323,679		

Fish Release Information

On September 30, 1987, 508,051 eyed eggs were shipped to the Pahsimeroi Hatchery. On October 6, 1987, an additional 103,000 eyed eggs were also shipped to Pahsimeroi. These eggs are to be used in an effort to reestablish a run of summer chinook onto the Pahsimeroi River.

On May 9, 1988, 87,800 fry (90.7 kg, 200 lbs) were released into Sand Creek, and 107,600 fry, (111.1 kg, 245 lbs) were released into Johnson Creek. On May 10, 1988, 101,900 fry (89.2 kg, 196.7 lbs) were released into Cabin Creek, on May 16, 1988, 201,000 fry (211.5 kg, 466.5 lbs) were released into the East Fork of the South Fork of the Salmon River, and on May 31, 1988 an additional 259,200 fry (283.5 kg, 625.1 lbs) were released into Johnson Creek; all of which are tributaries to the South Fork of the Salmon River.

During the period from March 20 to March 23, 1989, 975,000 smolts weighing 21,258 kg (46,875 lbs) were released into the South Fork of the Salmon River at the Knox Bridge. Of these, 267,750 smolts were carrying coded wire tags, of which 43,725 were freeze-branded, also. An additional 9,175 smolts were carrying freeze brands only (Appendix 4).

The smolts averaged 45.86 fish per kg (20.8 fish per pound) and 125.35 mm (4.93 inches). This represented an 89.1% survival from ponding to release. Total survival from green eggs to release was 75.3% (Figure 4).

IDFG pathologist Scott Foott conducted a smolt quality assessment prior to release. He tested for Renibacterium salmonarum (BKD), IPN virus, IHN virus, and FIBS, (see FISH HEALTH). There was no descaling reported.

FISH HEALTH

During spawning season, 188 individual fish were checked for BKD with kidney imprint slides. These slides were sent to the IDFG Eagle Pathology Lab for analysis **via** direct Flourescent Antibody Technique (FAT). The results of these tests showed 44 positive of the 188 fish sampled. Of the 44 (23.4%) positive samples, 25 (56.8%) were in the heavy positive category. In addition, the adults were sampled for various diseases including IPN and IHN viruses. These tests were negative.

There were other minor disease problems encountered with Brood Year 1987. There was a slight infestation of internal fungus Phoma herbarum, which accounted for .12% loss one month. There was also a problem with "Spring Thing" during the month of May; this accounted for approximately 1.7% mortality. The use of ten times the normal level of Pantothenic acid in the smaller fry feed has been successful in controlling "Spring Thing" at McCall Hatchery (Hutchinson 1985).

There was a chronic problem with BKD during the outside rearing period. The percent mortality of the marked groups was higher than the unmarked groups, with the apparent cause of death being BKD (Table 4).

Table 4. Brood Year 1987 marked fish mortality.

# Fish to start	Mark	Mortality	% Mort/group
258,859	CWT/AD Clip	19,795	7.6%
52,224	CWT/AD/FB	8,518	16.3%
10,019	FB	423	4.2%
3,034	PIT	5	.16%
709,919	NONE	28,319	4.0%

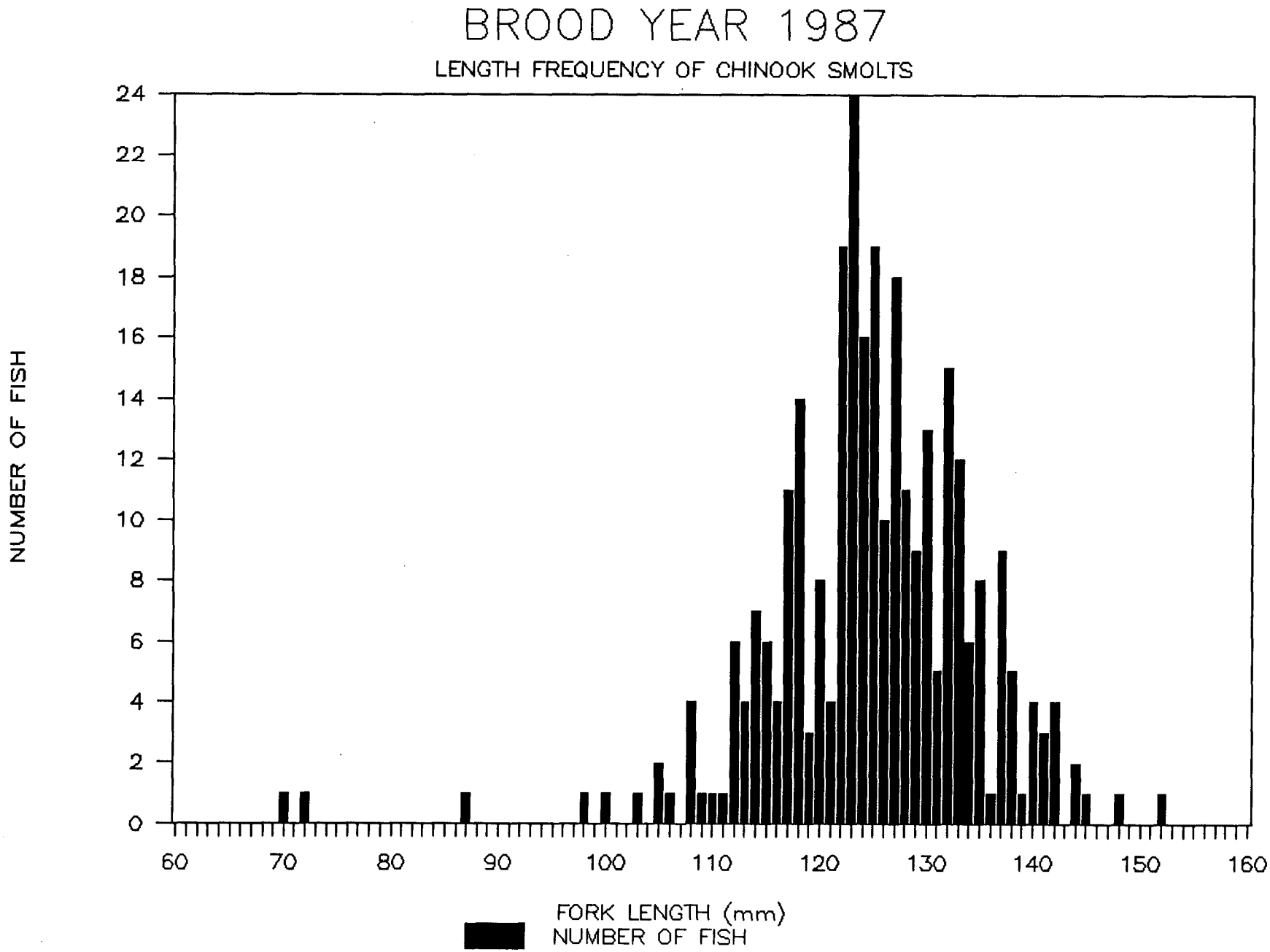

Figure 4. Length-frequency of 1987 Brood Year summer chinook smolts.

Results from the smolt assessment conducted by IDFG pathologists are given in Table 5.

Table 5. Results of Viral and Bacteriological Testing during the Smolt Assessment Testing.

Pathogen	Sample Size	Results
IPN	12	Negative
IHN	12	Negative
EIBS	60	Negative
R. Salmonarium	60	28 positive

SPECIAL STUDIES

Eggs were taken from visually positive BKD females during the 1987 spawning season to determine the viability of the offspring and to test oral treatments of Terramycin versus Erythromycin. The eggs and fry from these parents were incubated and reared in isolation from the "normal" progeny. There were 43,500 fry remaining in mid-July, and these fish were split into six equal groups. Three of these groups were put on a 14-day oral treatment of Terramycin, Erythromycin, and control (normal OMP IV, 10 x Pantothenic acid). The other three groups were put on a 21-day treatment, the same as above. Six "normal" groups were treated the same as above. The 21-day treatment of Erythromycin was the only effective measure. Mortality in the 21-day Erythromycin BKD positive group was lower than the other BKD positive groups. However, it was higher than the mortality of any of the normal groups.

LITERATURE CITED

Piper, R. G., I. B. McElwain, L. E. Orme, J. P. McCraren, L. G. Fowler, J. R. Leonard. Fish **H**atchery Management, United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. 517 p.

Hutchinson, B. 1986. Final Report McCall Summer Chinook Nutrition Evaluation Study, Idaho Department of Fish and Game. 8p.

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A P P E N D I C E S

Appendix 1. Length-frequency of adult chinook trapped at South Fork Salmon River, 1987.

Length (in)	Length (mm)	females	males	
16.00	406.40	0	1	400
18.00	457.20	0	13	
20.00	508.00	0	73	
22.00	558.80	0	115	
24.00	609.60	0	133	600
26.00	660.40	2	52	
28.00	711.20	27	16	
30.00	762.00	234	36	
32.00	812.80	49	405	800
34.00	863.60	176	193	
36.00	914.40	86	78	
38.00	965.20	45	25	
40.00	1016.00	8	6	100
42.00	1066.80	1	1	
44.00	1117.60	0	1	

Appendix 2. Correlation of released smolts and adult returns to the South Fork of the Salmon River weir and trap.

Brood year	Release date	Release number	Returns 3-year -old	4-year -old	5-Year -old	Total	Percent return
1978	1980	124,800	124	462	161	747	0.598
1979	1981	248,926	48	272	221	541	0.217
1980	1982	122,247	504	713	151	1,368	1.119
1981	1983	183,896	595	1,259	203	2,057	1.119
1982	1984	269,880	828	1,265	202	2,295	0.850
1983	1985	564,405	1,222	2,113	*	**	**
1984	1986	970,483	384	*	*	**	**
1985	1987	958,300					

(*) These fish have not returned yet
(**) Incomplete due to unavailable data

McCall hatchery summer chinook salmon adult return data by year.

Run date	3-year fish	4-year males	4-year females	5-year males	5-year females	Total
1980	92	50	24	2	1	169
1981	124	171	135	31	63	524
1982	48	294	168	12	28	550
1983	504	108	164	85	76	937
1984	595	296	417	135	86	1,529
1985	828	467	792	47	104	2,238
1986	1,222	722	543	70	133	2,690
1987	386	1,158	959	82	120	2,705

Jack = <65 cm
4-year-olds = 65 cm through 89 cm
5-year-olds = >89 cm

REL&RET

Appendix 3. Drugs, chemicals and compounds commonly used at McCall Hatchery.

Compound	Rate	Use	Source
Iodophor	100 ppm Titratable	disinfectant for eggs	Argent Chemical
Sodium	0.5%	Buffer for lodophor	common baking soda
Formalin	1,667 ppm 15 minutes	fungus control on eggs	Argent Chemical
Benzalkonium Chloride	600 ppm 1 hr	topical disinfectant	Argent Chemical
Chlorine	200 ppm 1 hr	topical disinfectant	Steve Regan Co.
Sodium Thiosulfate	5.6 gm/ gallon of 200 ppm Cl	neutralize Chlorine solution	Steve Regan Co.

Appendix 4. Summary of Brood Year 1987 tags released.

Tag code	Total marked	Total mort.	Mark loss	% Mark loss	Marks released
10-31-41	51,694	3,101	2,187	4.5	46,400
10-31-42	51,511	3,091	2,179	4.5	46,250
10-31-43	51,534	2,942	2,187	4.5	46,400
10-31-44	52,848	5,919	2,581	5.5	44,350
10-31-45	51,272	5,742	2,504	5.5	43,025
10-31-46	52,224	8,488	2,405	5.5	41,325
* RA-R1	17,245	3,138	0	0	14,100
* RA-R2	17,202	3,429	0	0	13,775
* RA-R3	17,777	1,951	0	0	15,850
RA-R4	10,019	423	417	4.35	9,175

* Same fish as CWT 10-31-46, not additional fish.

Appendix 5. McCall Hatchery summer chinook salmon adult return data.

Run Date	Jacks	Adults	Totals
1980	186	194	380
1981	124	400	524
1982	48	502	550
1983	504	433	937
1984	595	934	1,529
1985	828	1,410	2,238
1986	1,222	1,468	2,690
1987	386	2,319	2,705

APP4&5

Appendix 6. Coded wire tag recoveries during 1987 returns.
(Known age groups by CWT Data.)

Size range	Age group	# Males	#
< 590 mm	3-year	2	-
590-970 mm	4-year	99	-
660-890 mm	4-year	-	105
820-1050 mm	5-year	36	-
770-1020 mm	5-year	-	15

Appendix 7. South Fork adult return lengths, 1987.

Lenqth (mm)	Number (mm)	Lenqth (mm)	Number (mm)
70	1	113	4
71	0	114	7
72	1	115	6
73	0	116	4
74	0	117	11
75	0	118	14
76	0	119	3
77	0	120	8
78	0	121	4
79	0	122	19
80	0	123	24
81	0	124	16
82	0	125	19
83	0	126	10
84	0	127	18
85	0	128	11
86	0	129	9
87	1	130	13
88	0	131	5
89	0	132	15
90	0	133	12
91	0	134	6
92	0	135	8
93	0	136	1
94	0	137	9
95	0	138	5
96	0	139	1
97	0	140	4
98	1	141	3
99	0	142	4
100	1	143	0
101	0	144	2
102	0	145	1
103	1	146	0
104	0	147	0
105	2	148	1
106	1	149	0
107	0	150	0
108	4	151	0
109	1	152	1
110	1	153	0
111	1	154	0
112	6	155	0

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